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Rebot

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(54) **CLIP FOR MOUNTING EXTERNAL DEVICE TO ELECTRONIC DEVICE**

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See application file for complete search history.

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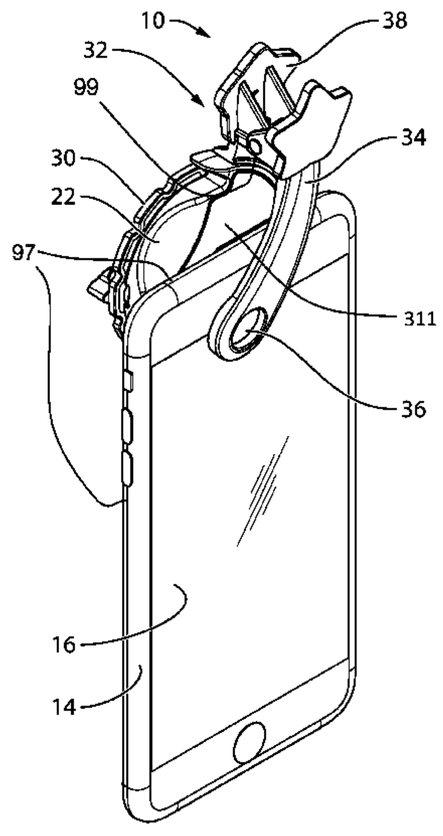
(57) **ABSTRACT**

In an aspect, a device-and-clip system is provided for an electronic device. The system includes an external device that cooperates with at least one electronic device feature on the rear face to perform a selected function. The system includes a clip including a first clip arm having an arm marker thereon and which is engageable with the front face of the electronic device and a second clip arm that is engageable with the rear face of the electronic device. The system further includes an application that is executable to instruct the electronic device to display a screen marker on the display screen in a selected position and in a selected orientation such that positioning and orienting of the first clip arm on the display screen of the smart phone with the arm marker aligned with the position and orientation of the screen marker positions the external device in alignment with the at least one electronic device feature.

14 Claims, 10 Drawing Sheets



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a continuation-in-part of application No. PCT/CA2017/000152, filed on Jun. 16, 2017, which is a continuation-in-part of application No. 15/217,067, filed on Jul. 22, 2016.

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G02B 7/00	(2006.01)

(52) **U.S. Cl.**

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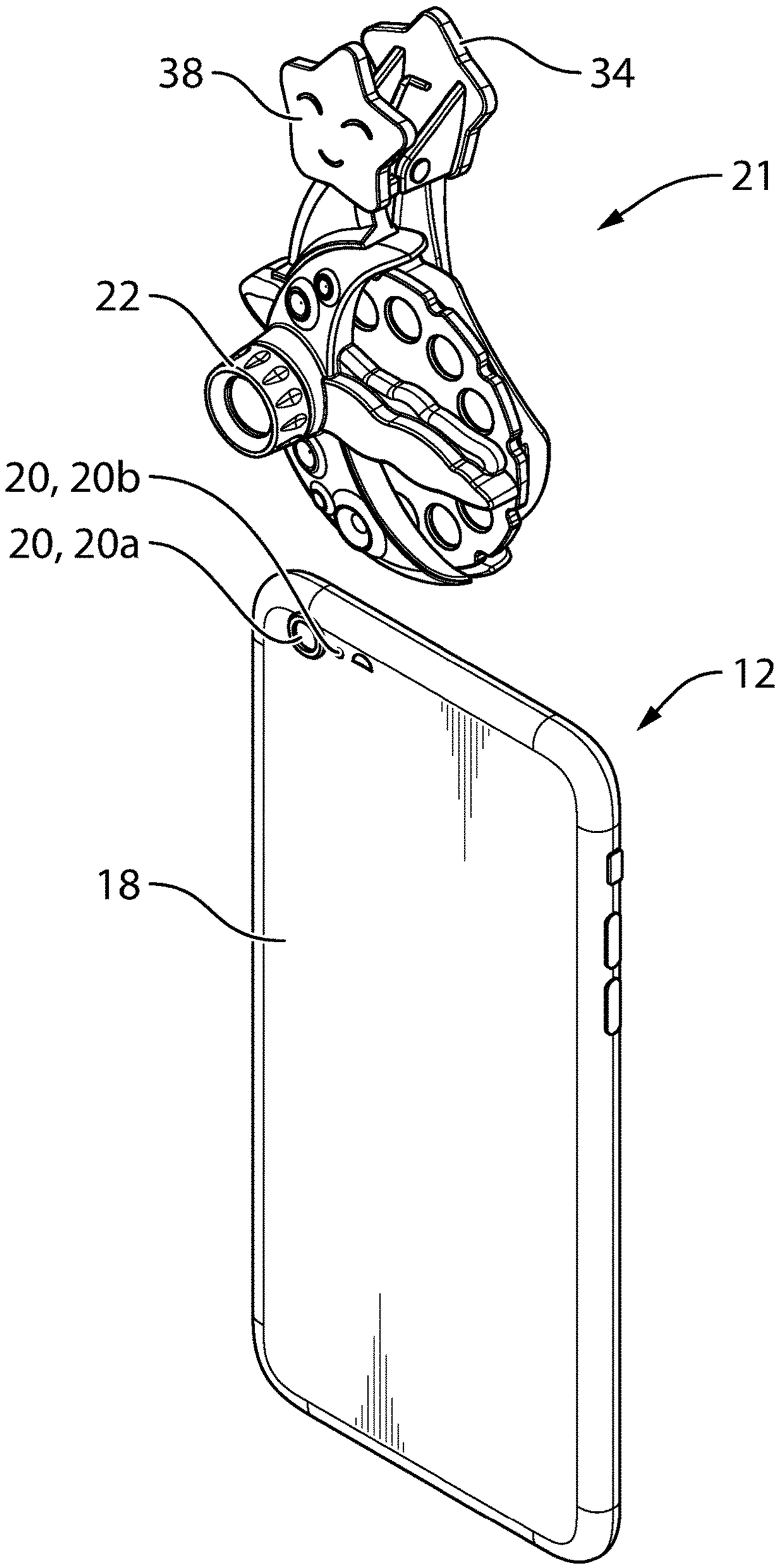

FIG. 1

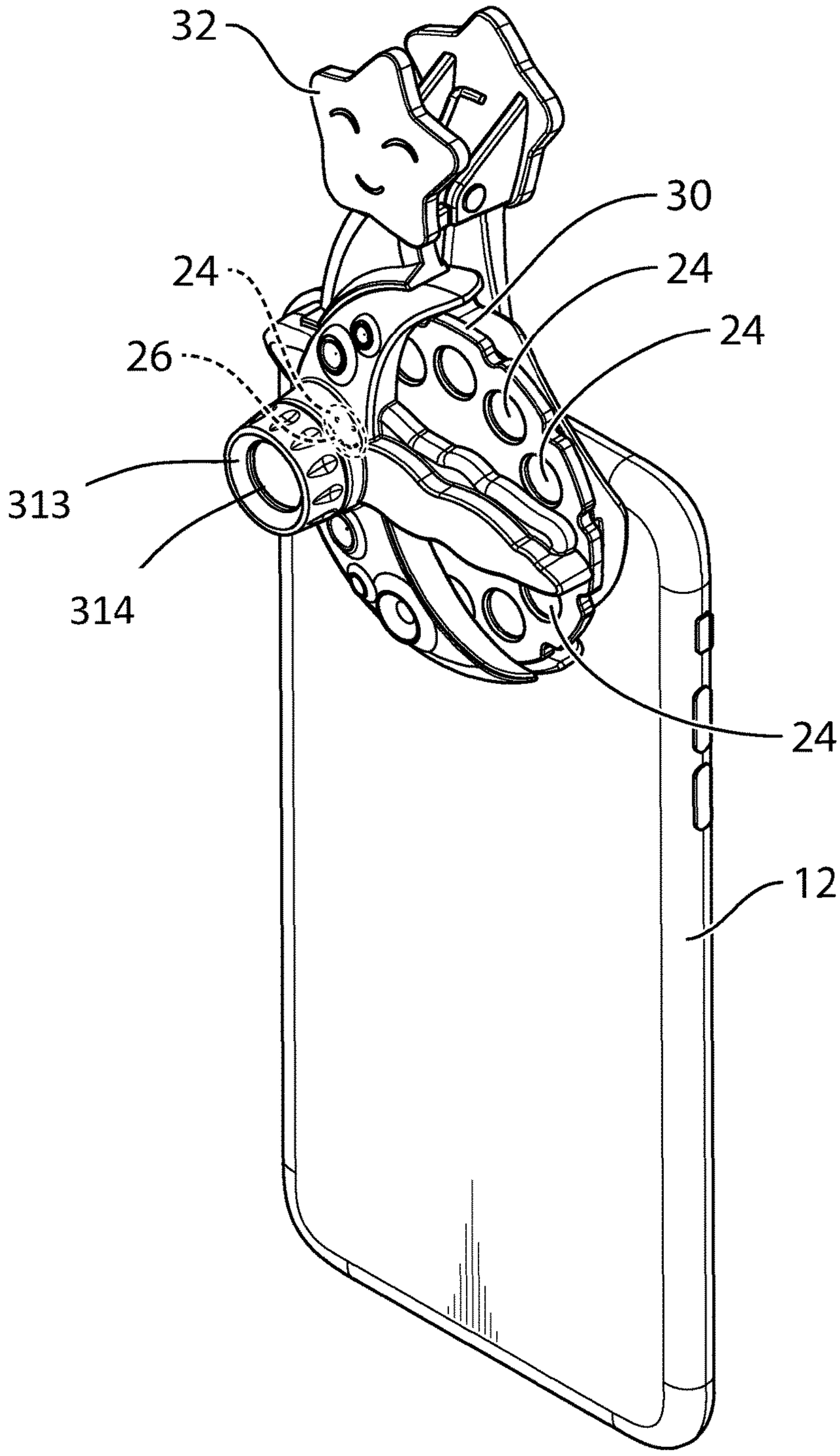

FIG. 2

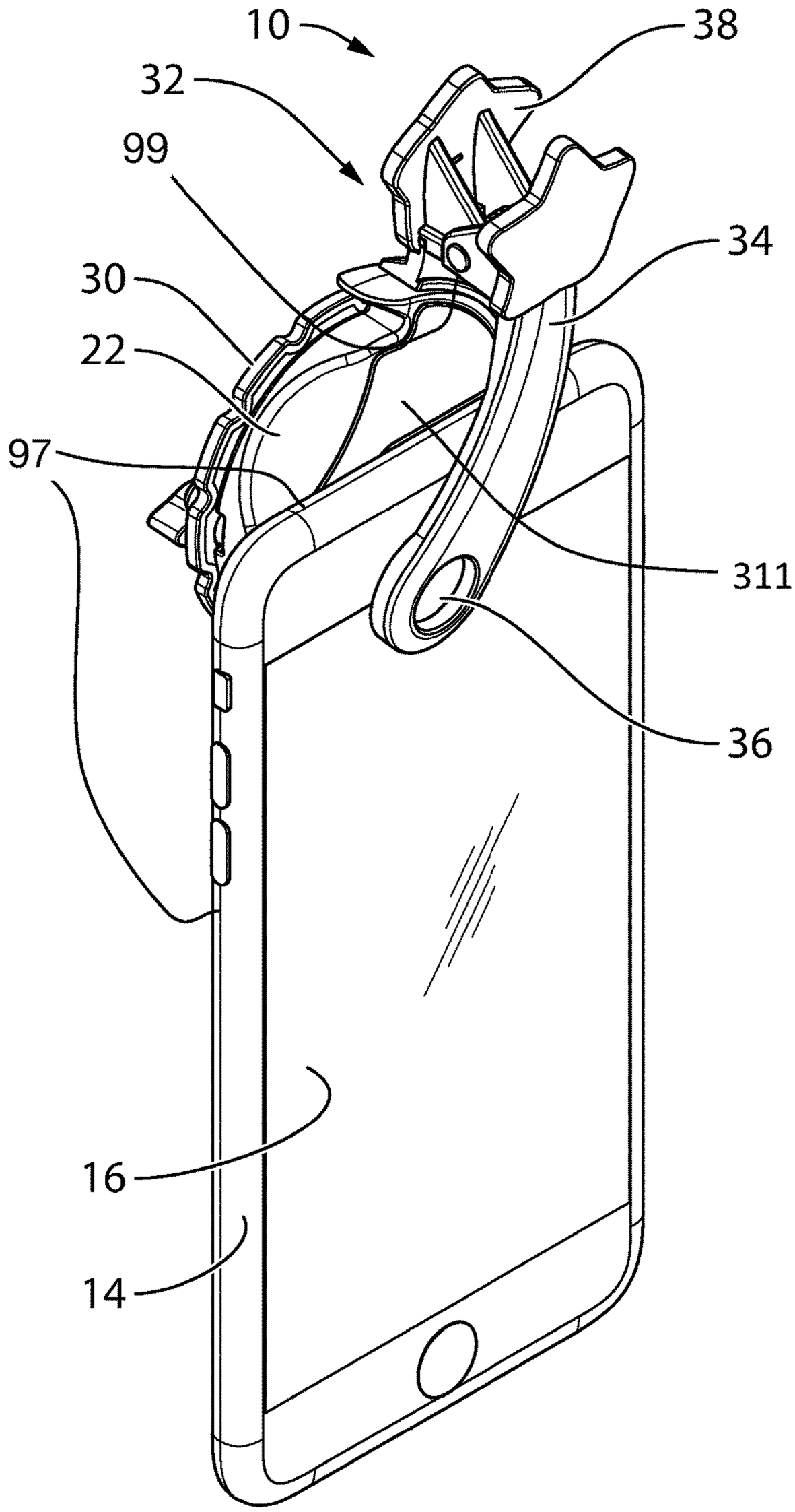

FIG. 3

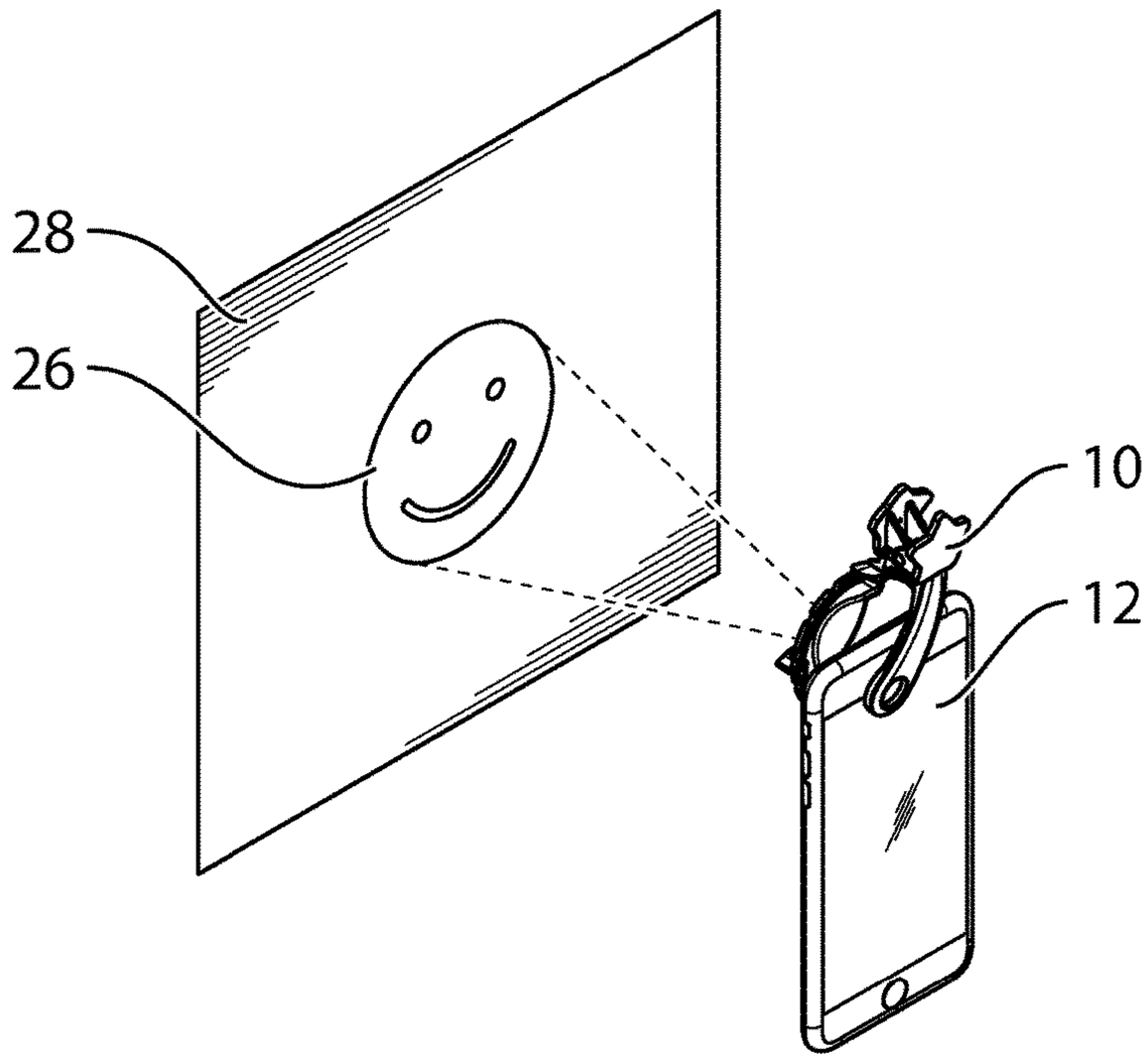

FIG. 4

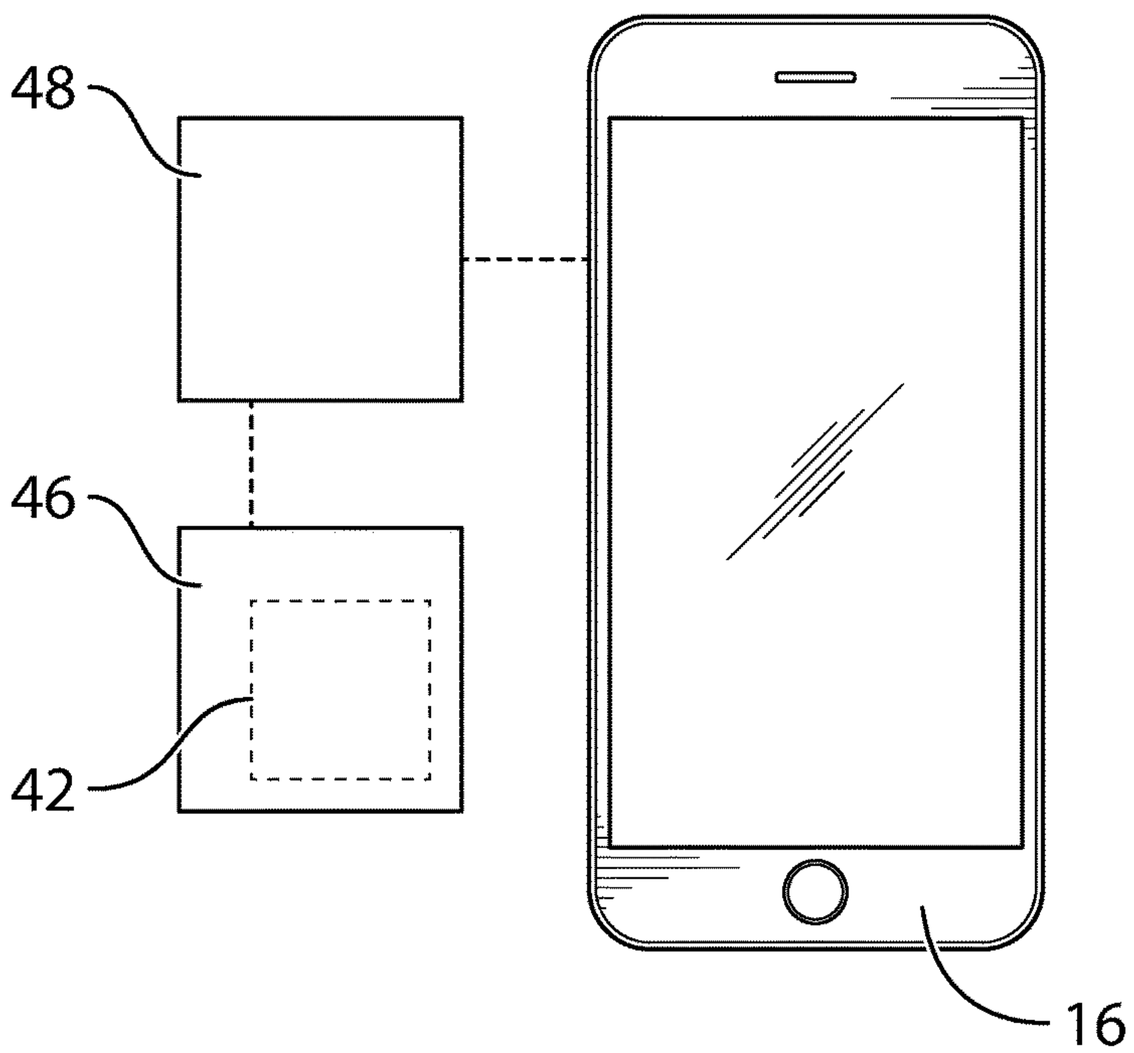

FIG. 5

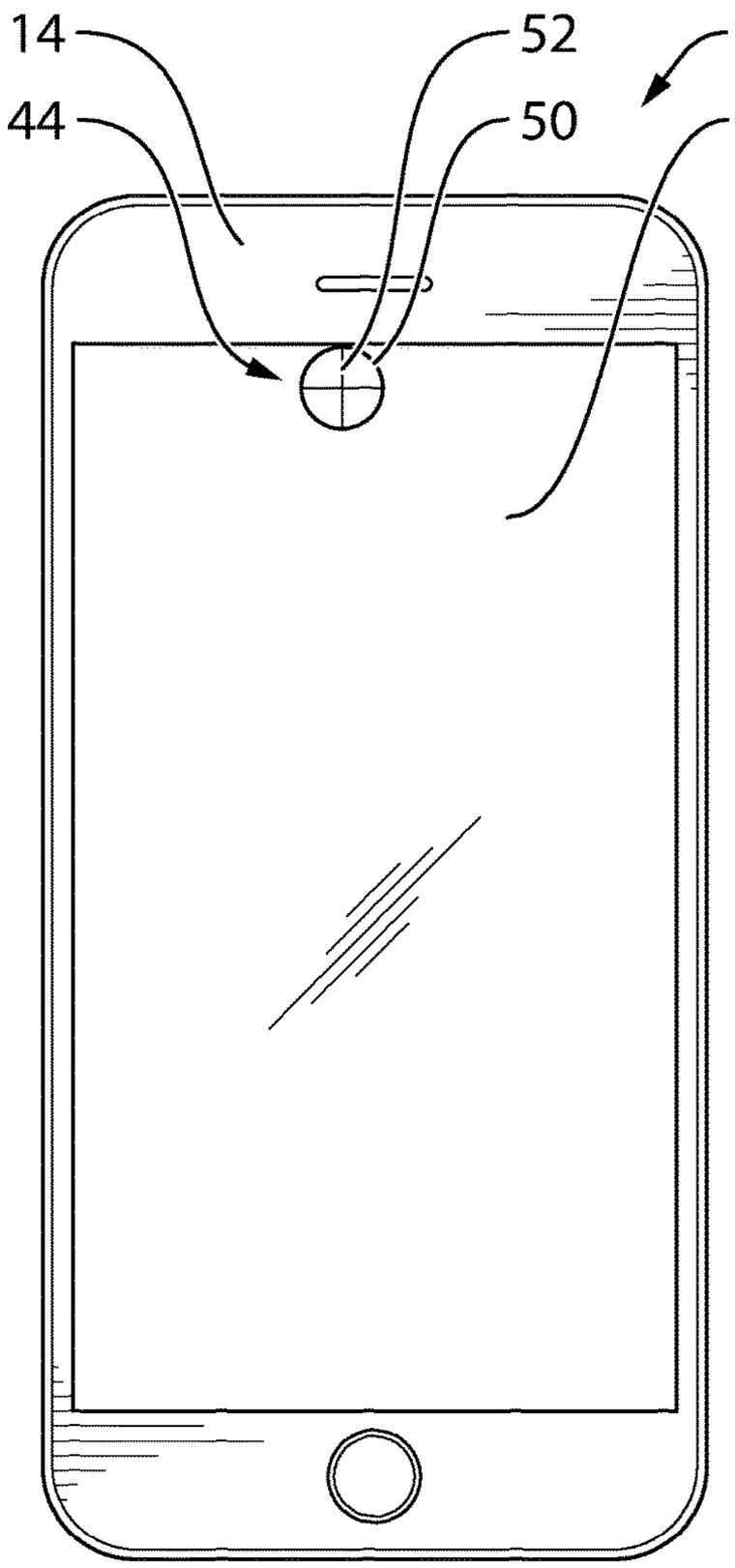

FIG. 6a

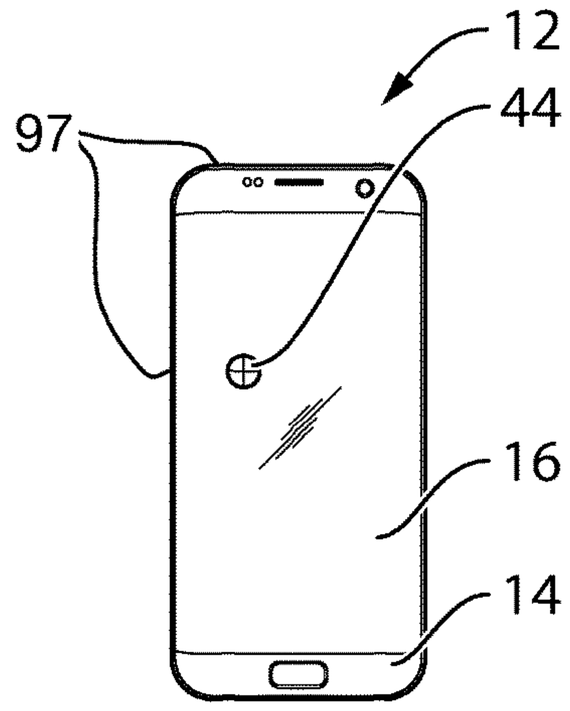

FIG. 6b

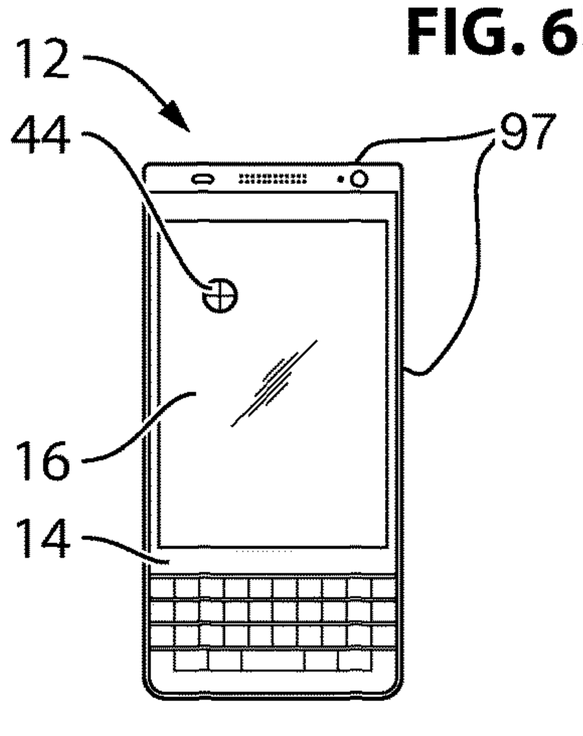

FIG. 6c

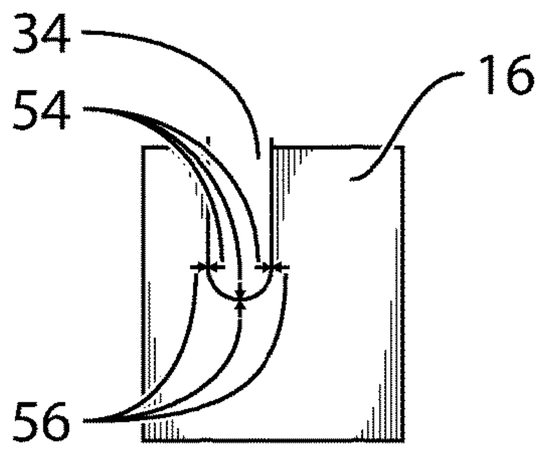

FIG. 7

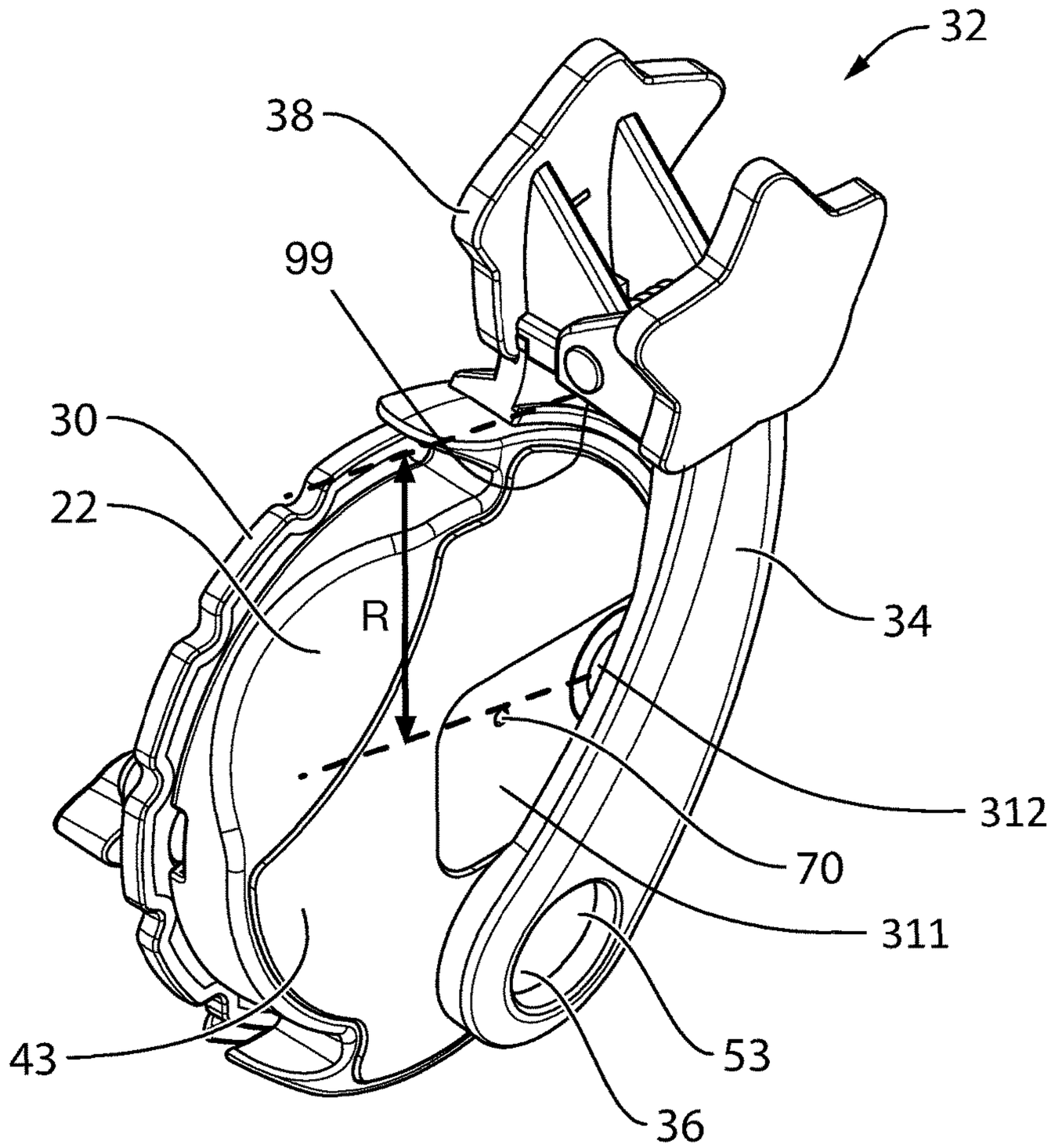

FIG. 8

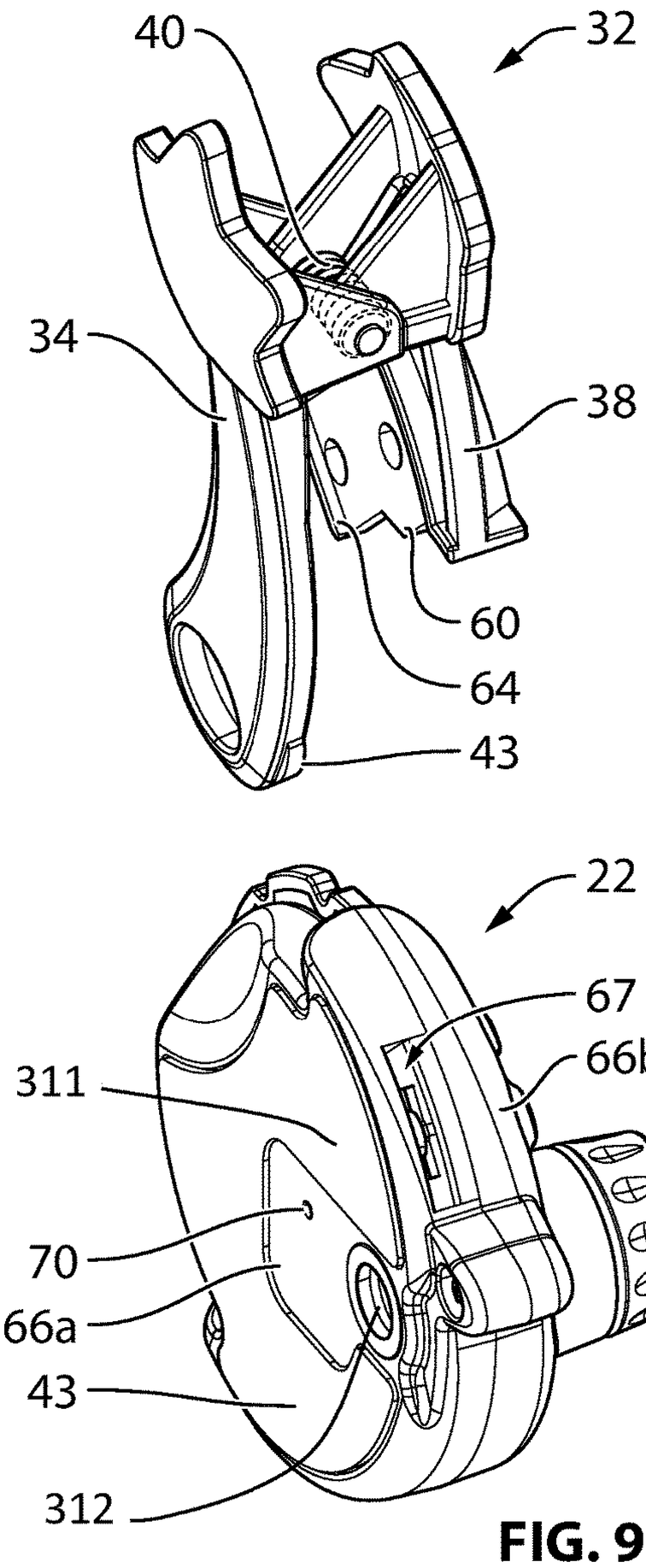

FIG. 9

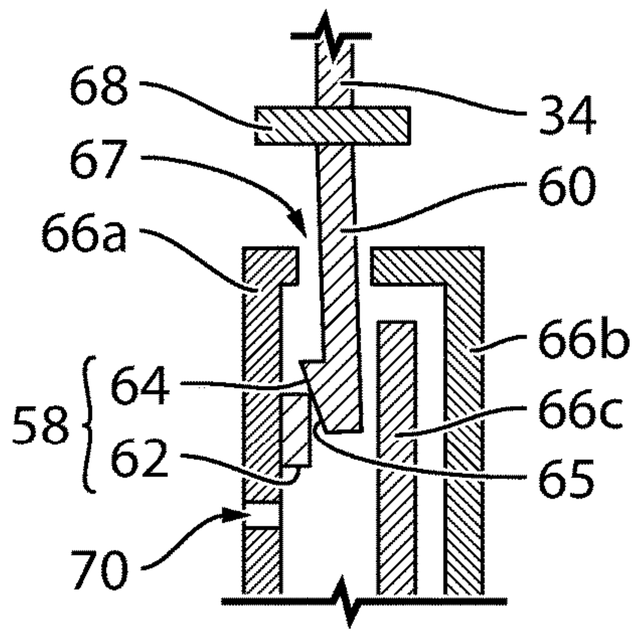

FIG. 10A

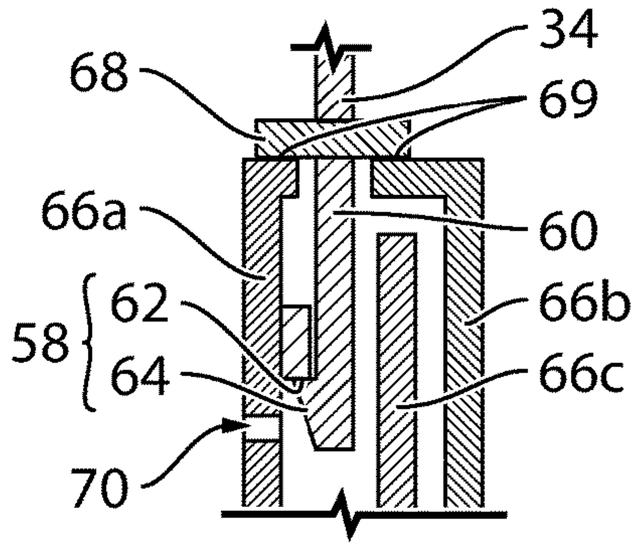

FIG. 10B

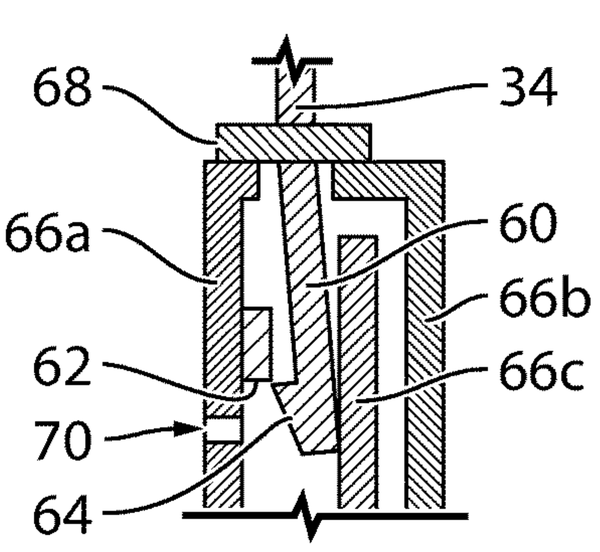

FIG. 10C

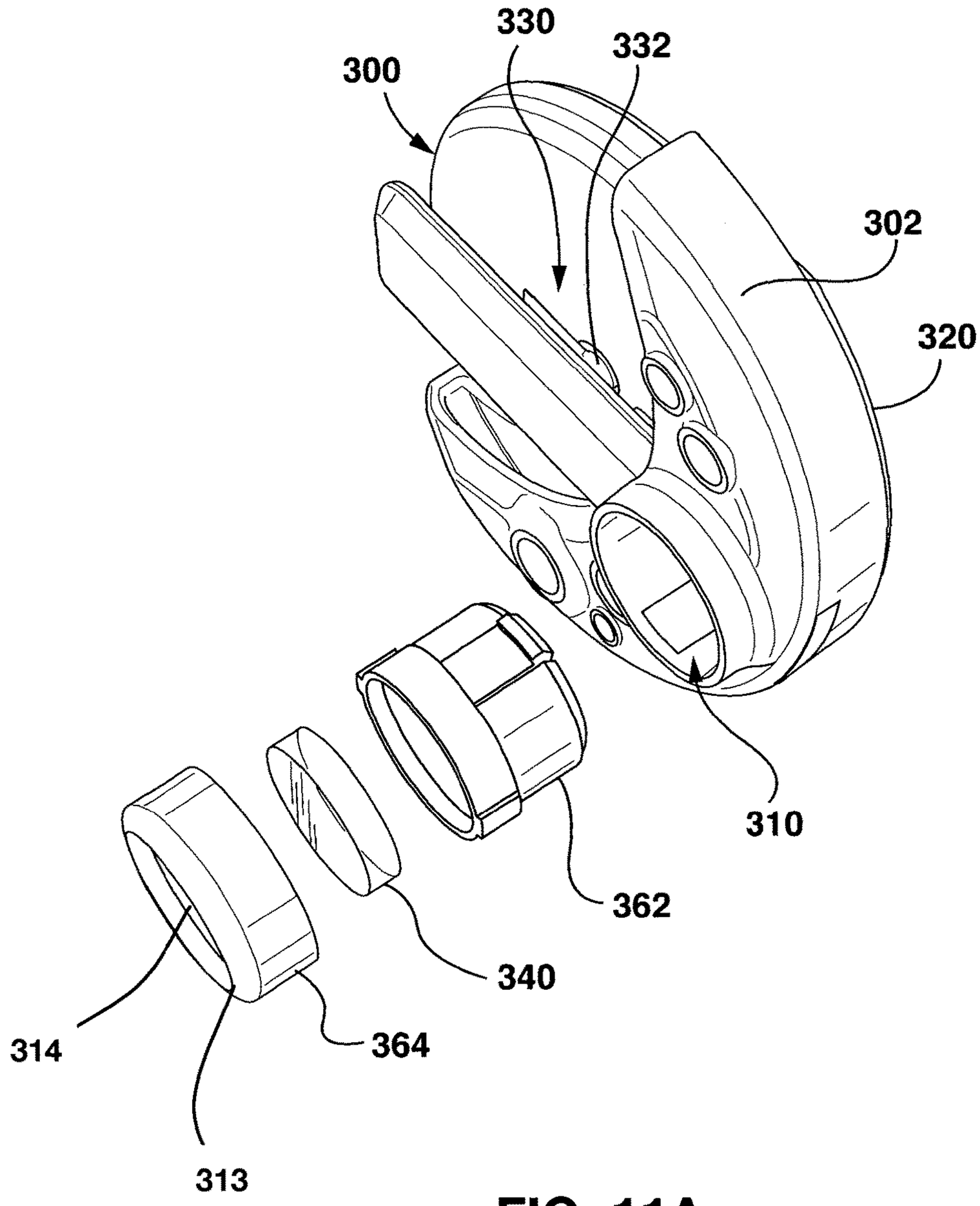

FIG. 11A

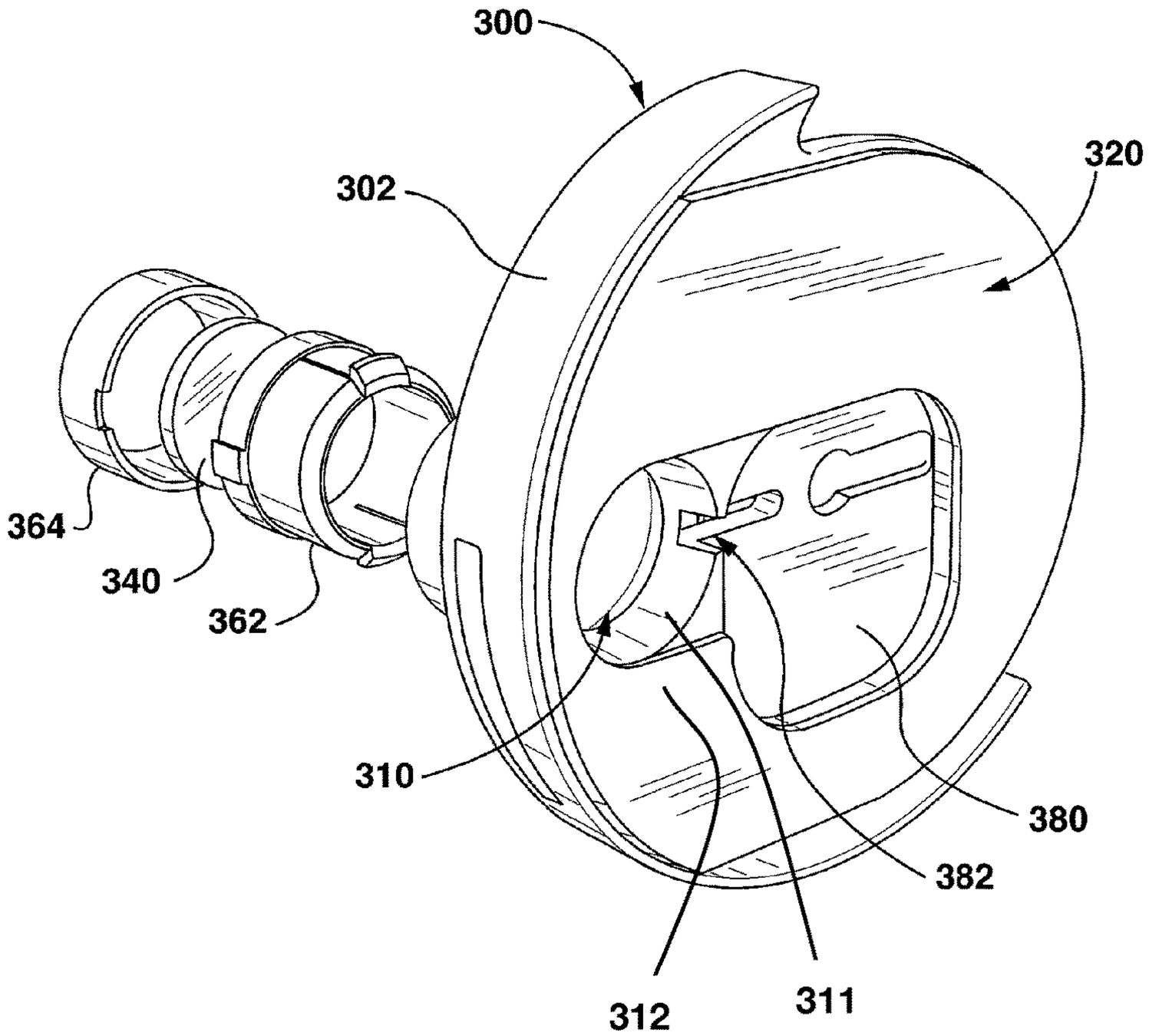

FIG. 11B

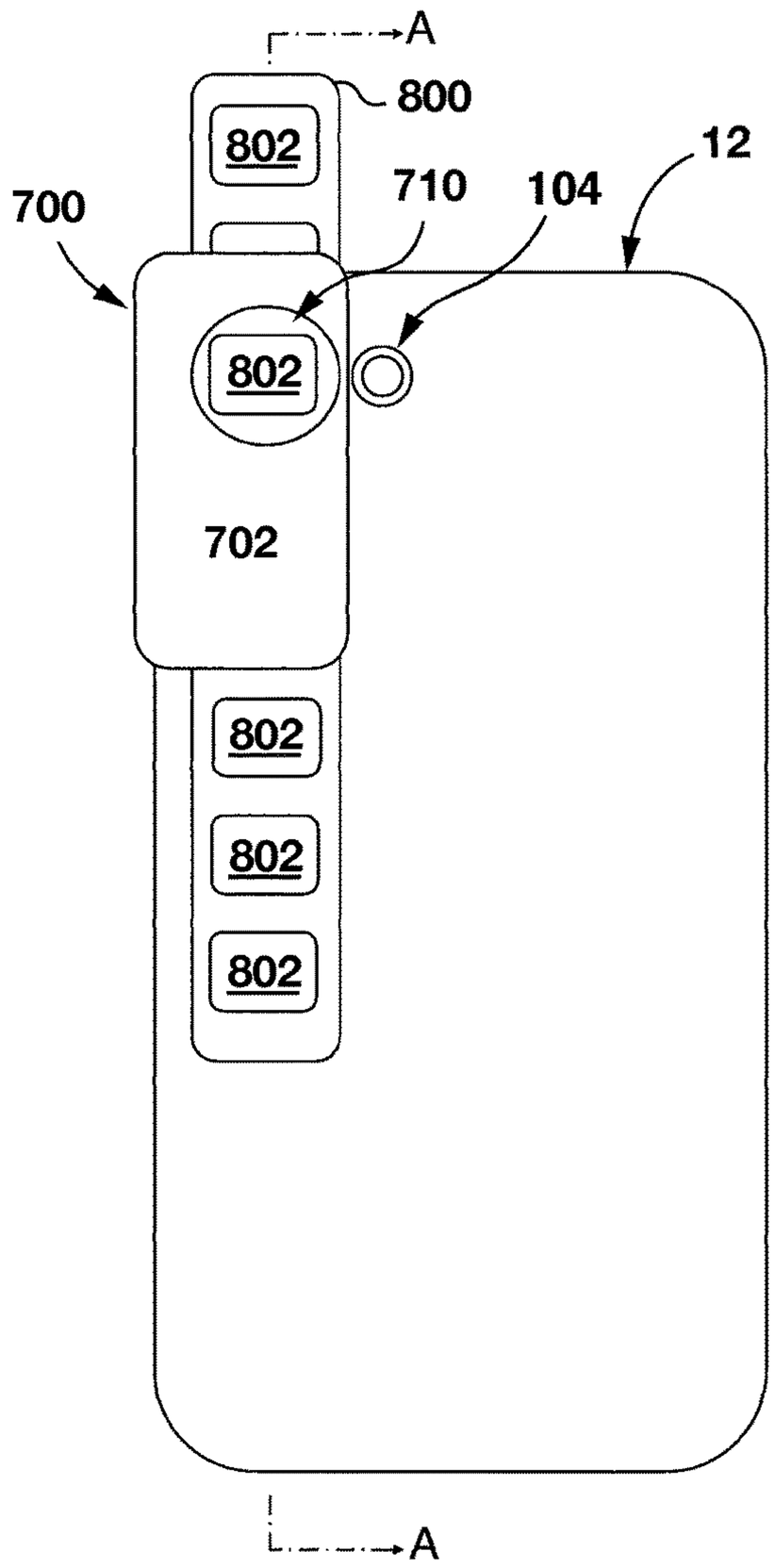

FIG. 12A

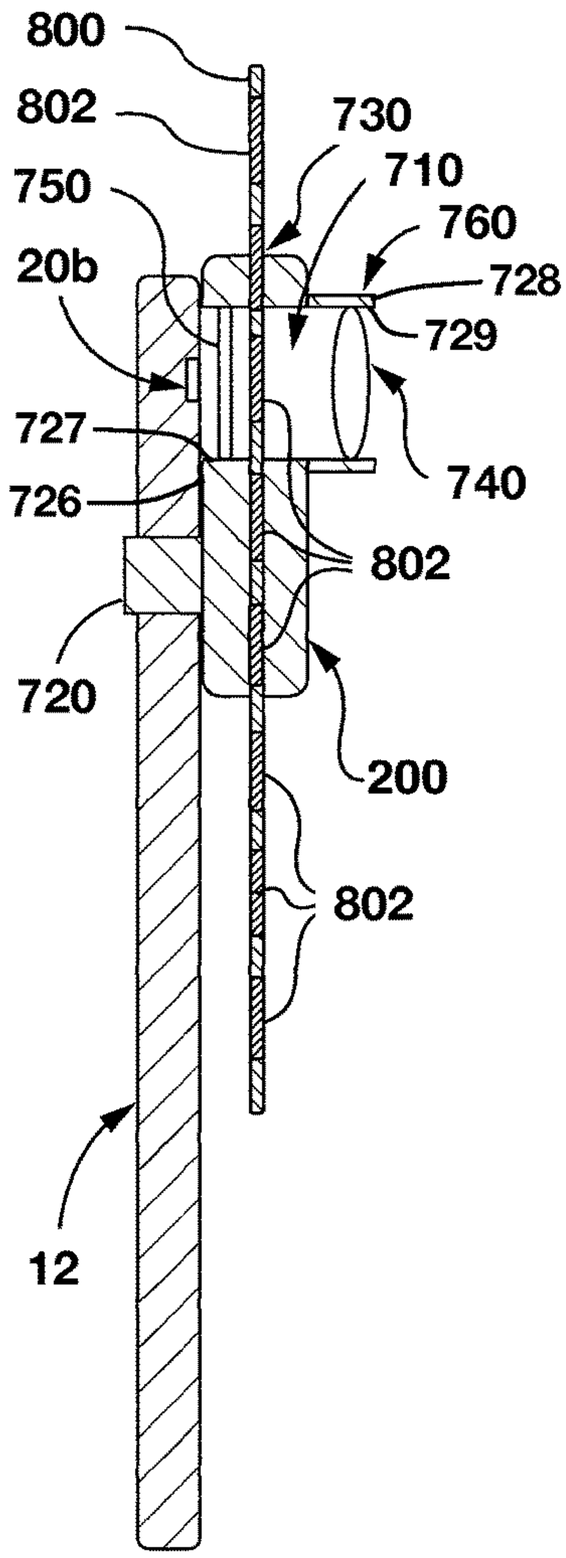

FIG. 12B

CLIP FOR MOUNTING EXTERNAL DEVICE TO ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 15/712,259, filed Sep. 22, 2017 and is a continuation-in-part of PCT application PCT/CA2017/000152, filed Jun. 16, 2017, which is a continuation-in-part of U.S. patent application Ser. No. 15/217,067, filed Jul. 22, 2016, and which claims priority to U.S. Provisional Application No. 62/351,506 filed Jun. 17, 2016, the contents of all of which are incorporated by reference herein.

FIELD

The specification relates generally to clips for mounting external devices, such as projectors, to electronic devices, such as smartphones and tablets, and more particularly to a clip that can mount an external device to different models of electronic device, such as a clip that can mount a projector to an Apple iPhone 6, an Apple iPhone SE, an Apple iPad Pro 12.9", a Samsung Galaxy S8, and a Samsung Galaxy Tab S3.

BACKGROUND OF THE DISCLOSURE

It is known to provide mounting systems for mounting devices to smartphones such as camera lens systems which cooperate with the smartphone camera to provide enhanced capability such as the ability to zoom in by more than is possible on the smartphone itself. However, it can be difficult to ensure that the device, when mounted, is in suitable alignment with the feature of the smartphone that it is intended to cooperate with.

SUMMARY OF THE DISCLOSURE

In an aspect, a device-and-clip system is provided for an electronic device such as a smartphone or a tablet having a front face with a display screen thereon, a rear face opposite to the front face, and an edge between the front and rear faces. The device-and-clip system includes an external device that is separate from the electronic device and which has an external device feature. The external device is cooperable with the electronic device when the external device feature is aligned with an electronic device feature on the rear face to perform a selected function. The device-and-clip system includes a clip including a first clip arm having an arm marker thereon and which is engageable with the front face, and a second clip arm that is engageable with the rear face. The first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device. The external device is mounted to the clip. The clip has a clip limit surface that is engageable with the edge of the electronic device to determine a reach of the external device feature on the rear face of the electronic device. The clip limit surface is positioned such that, for a first type of electronic device in which the electronic device feature is positioned at a first distance from the edge, the clip is mountable to the first type of electronic device with the external device feature aligned with the electronic device feature on the rear face such that the clip limit surface is spaced from the edge. For a second type of electronic device

in which the electronic device feature is positioned at a second distance from the edge that is different than the first distance, the clip is mountable to the second type of electronic device with the external device feature aligned with the electronic device feature on the rear face of the second type of electronic device.

In another aspect, a device-and-clip assembly is provided for an electronic device such as a smartphone or a tablet having a front face with a display screen thereon, and a rear face opposite to the front face. The device-and-clip assembly includes an external device that is separate from the electronic device but which cooperates with at least one electronic device feature on the rear face to perform a selected function, and a clip. The clip includes a first clip arm having an arm marker thereon and which is engageable with the front face, and a second clip arm that is engageable with the rear face. The first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device, wherein the external device is mounted to the clip. The device-and-clip assembly further include an application that is executable by the electronic device so as to instruct the electronic device to display a screen marker on the display screen in a selected position such that positioning of the first clip arm on the display screen with the arm marker aligned with the position of the screen marker positions the external device in alignment with the at least one electronic device feature.

In yet another aspect, a device-and-clip system is provided for an electronic device such as a smartphone or a tablet having a front face with a display screen thereon, and a rear face opposite to the front face. The device-and-clip system includes a projector that is separate from the electronic device. The projector has an aperture therethrough, an inside face defining a light inlet to the aperture, and an outside face defining a light outlet from the aperture. The projector further includes a slot positioned to hold a slide transparency in the aperture for transmission of light therethrough. The projector further includes a magnifying lens aligned with the aperture and positioned to enlarge an image on the slide transparency for projection through the light outlet. The device-and-clip system further includes a clip including a first clip arm that is engageable with the front face, and a second clip arm that is engageable with the rear face, wherein the first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device. In the closed position, the projector is holdable by the clip such that the light inlet faces the light-emitting element so as to receive light therefrom into the light passage, so as to transmit said light through the slide transparency, and project an image on the slide transparency out through the light outlet onto a suitable receiving surface.

BRIEF DESCRIPTIONS OF THE DRAWINGS

For a better understanding of the various embodiments described herein and to show more clearly how they may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings in which:

FIG. **1** is a perspective view of a device-and-clip assembly that is mountable to an electronic device such as a smartphone according to a non-limiting embodiment;

FIGS. **2** and **3** are perspective views of the device-and-clip assembly shown in FIG. **1** mounted to the electronic device;

FIG. **4** is a perspective view of the device-and-clip assembly being used to project an image on a receiving surface;

FIG. **5** is a schematic view of an application that is executable by the electronic device that cooperates with a structure on the device-and-clip assembly to assist in positioning and aligning the device-and-clip assembly on the electronic device;

FIG. **6**A is a plan view of the electronic device during execution of the application;

FIGS. **6**B and **6**C are plan views of other examples of the electronic device during execution of the application;

FIG. **7** is a plan view of an alternative structure on the device-and-clip assembly and an alternative application that cooperate to assist in positioning and aligning the device-and-clip assembly on the electronic device;

FIG. **8** is a perspective view of the device-and-clip assembly;

FIG. **9** is a perspective exploded view of device-and-clip assembly;

FIGS. **10**A, **10**B and **10**C are sectional views of the device-and-clip assembly during connection of an external device from the device-and-clip assembly to a cip arm from the device-and-clip assembly;

FIG. **11**A is front perspective exploded view of an embodiment of projector;

FIG. **11**B is a rear perspective exploded view of the image projection device of FIG. **11**A;

FIG. **12**A is a rear view of an image projection device attached to a variant of the mobile device of FIG. **1**; and

FIG. **12**B is a cross-sectional view of the image projection device of FIG. **12**A along line A-A.

DETAILED DESCRIPTION

Reference is made to FIGS. **1**, **2** and **3**, which show a device-and-clip system for an electronic device **12** such as a smartphone or a tablet. The device-and-clip system is configured to permit a user to properly position and use an external device with the electronic device **12**. The electronic device may also be referred to as a mobile device **12**.

The electronic device **12** has a front face **14** (FIG. **3**) with a display screen **16** thereon, and a rear face **18** (FIGS. **1** and **2**) opposite to the front face **14**. The rear face **18** has at least one electronic device feature **20** thereon. In the present example, the rear face **18** has a plurality of features **20**, including a camera **20***a*, and a light-emitting element **20***b*, which may be, for example, an LED. In some embodiments, the light-emitting element **20***b* may serve as a camera flash and as a flashlight on the electronic device **20**. For greater certainty, the term 'camera flash' is used in various places in the present disclosure, however it is merely a way of identifying the light-emitting element **20***b* in a readable way. It will be understood by one skilled in the art, however, that the 'camera flash' is intended to mean a light-emitting element that is provided on the electronic device **20**. The camera **20***a* has a camera aperture **104** (FIG. **11**) and typically includes optics (i.e. lenses and/or mirrors) and a CMOS-based image sensor to capture digital images. The camera **20***a* can be controlled through a combination of software and hardware operating on the mobile device **12**.

The device-and-clip system includes a device-and-clip assembly **21** (FIG. **1**) that is mountable to the electronic device **12** and an application **42** (shown schematically at **42** in FIG. **5**) that is executable on the electronic device **12**.

The device-and-clip assembly **21** includes an external device **22** that is separate from the electronic device but which cooperates with at least one electronic device feature **20** (FIG. **1**) on the rear face **18** to perform a selected function. The at least one electronic device feature **20** may be selected from the group of features consisting of the camera **20***a*, the light-emitting element **20***b*, a laser, a fingerprint sensor, or any other suitable feature. In the present example, the external device **22** is a projector that is positioned to receive light from the light-emitting element **20***b*, to pass the light through a transparent slide **24** (FIG. **2**) containing an image **26**, and to project the image **26** onto a suitable receiving surface **28** (FIG. **4**), such as a wall, a ceiling, a floor or any other suitable receiving surface. Thus, the aforementioned selected function is to project the image **26** onto the receiving surface **28**. In the example shown, the slide **24** is one of a plurality of slides **24** that are held on a slide disk **30**. The slide disk **30** is rotatable in the projector so that each slide may in turn be positioned to receive light from the light-emitting element **20***b*. For the purposes of the present disclosure, the term 'projector' may be used interchangeably with the term 'image projection device'.

It will be understood that the projector is but an example of the external device. The external device **22** could alternatively be some other type of a device, such as, for example, a special lens holder that cooperates with the camera **20***a* to permit very high magnification photographs to be taken. The external device **22** could itself incorporate electronics and could, therefore, be an electronic device. However, for the purposes of identification it is referred to consistently in the present disclosure as the external device **22**, and the device to which it is mounted via the clip **32** is referred to as the electronic device **12**.

Referring to FIGS. **8** and **9**, the device-and-clip assembly **21** further includes a clip **32** including a first clip arm **34** having an arm marker **36** thereon, and which is engageable with the front face **14** of the electronic device **12** as explained in further detail below. The clip **32** further includes a second clip arm **38** that is engageable with the rear face **18** of the electronic device **12**. The first and second clip arms **34** and **38** are connected to one another and are movable between an open position to permit removal of the clip **32** from the electronic device **12** and a closed position in which the first and second clip arms **34** and **38** clamp the electronic device **12**. The first and second clip arms **34** and **38** are biased towards the closed position by any suitable means, such as by a clip biasing member **40**. In the present example, the clip biasing member **40** is a helical torsion spring, however, any other suitable type of structure may be used as the clip biasing member **40**.

Optionally, one or both of the first and second clip arms **34** and **38** may be provided with a gripping layer **43** such as a nano-suction material, a rubber layer, or any other suitable layer to assist in retaining the device-and-clip assembly **21** in place once it is mounted to the electronic device **12**. In the present example, both the first and second clip arms **34** and **38** include a gripping layer **43** thereon.

The external device **22** may be mounted to the clip **32** in any suitable way. An example structure that is used to mount the external device **22** to the clip **32** is described further below.

FIG. **5** is a schematic layout of some of the hardware that makes up the electronic device **12**. Referring to FIGS. **5** and **6**A, the application **42** (FIG. **5**) is executable by the electronic device **12** so as to instruct the electronic device **12** to

display a screen marker **44** (FIG. **6**A) on the display screen **16** in a selected position and a selected orientation such that positioning and orienting of the first clip arm **34** on the display screen **16** with the arm marker **36** aligned with the position and orientation of the screen marker **44** positions the external device **22** in alignment with the at least one electronic device feature (in this case **20***b*).

The screen marker **44** therefore has a shape that has a distinguishable orientation. In the example shown, the screen marker **44** is a circle **50** (albeit with a clipped section at the top) that is positioned at the upper edge of the display screen **16**, and which has a cross hair **52** inside it. In the example shown, the circle **50** is displayed in a first colour (e.g. white), and the cross hair **52** is displayed in a second colour that is different than the first colour (e.g. black). Alternatively, any other suitable shape may be used for the screen marker **44** instead of the aforementioned circle **50** and cross hair **52**.

With reference to FIG. **5**, the application **42** may be stored in a memory **46** in the electronic device **12** and is executed by a processor **48** in the electronic device **12**.

It will be noted that different smartphones have their features **20** in different locations. For example, the light-emitting element **20***b* on an iPhone™ SE is about 0.25 inches down and about 0.69 inches over laterally from the upper right corner of the electronic device. However, on an iPhone™ 6 Plus, the light-emitting element **20***b* is about 0.25 inches down and about 1 inch over laterally from the upper right corner of the electronic device. The application **42** may be configured to determine the particular model of smartphone **12** that it is running on. It may then be configured to display the screen marker **44** in the appropriate place based on the determined model of smartphone **12**. Examples of other screen markers **44** shown in other positions on other types (i.e. other make and/or model) of an electronic device **12** are shown in FIGS. **6**B and **6**C. In these other examples of an electronic device **12** it will be noted that the circle **50** is not clipped since it is not at an edge of the display screen **16**. For greater clarity, the electronic device **12** shown in FIG. **6**A may be representative of an iPhone™ 6 Plus made by Apple Inc., while the electronic device **12** shown in FIG. **6**B may be representative of a Samsung Galaxy™ S7 Edge, made by Samsung Electronics Co., Ltd., while the electronic device **12** shown in FIG. **6**C may be representative of a Blackberry Keyone™, made by Blackberry Limited.

As can be seen in FIG. **7**, and as implicitly expressed by the positions of the screen markers **44** in FIGS. **6**A through **6**C, the clip **32** is sized to be able to fit different types of electronic device **12**, which have different distances of the light-emitting element **20***b* from their edges. The distance of the light emitting element **20***b* on the iPhone™ 6 Plus and SE is about 0.25" to the upper portion of the edge in both cases and about 1" (for the 6 Plus) or 0.6" (for the SE) from the side portion of the edge. In embodiments where the clip **32** is intended to stand upright on the iPhone 6 Plus or the SE, the relevant distance between the light-emitting element **20***b* and the edge is therefore 0.25". The distance of the light emitting element to the edge for the Samsung Galaxy™ S7 Edge is about 0.85" from the upper portion of the edge and about 0.85" over from the left side portion of the edge. In embodiments where the clip **32** is intended to stand upright on the Samsung Galaxy™ S7 Edge, the relevant distance between the light-emitting element **20***b* and the edge is therefore 0.85". The distance of the light-emitting element **20***b* to the edge for the Blackberry™ Keyone is about 0.34" down from the upper portion of the edge and about 0.45" over from the right side portion of the edge. In embodiments where the clip **32** is intended to stand upright on the Blackberry™ Keyone, the relevant distance between the light-emitting element **20***b* and the edge is therefore 0.34". The edge is shown at **97** in the figures.

As can be seen in FIG. **3**, and as would be understood by one skilled in the art, the surface shown at **99** on the clip **32** is what limits the reach of the light inlet **312** on the rear face **18** of the electronic device **12**. The surface **99** may be referred to as a clip limit surface **99**. The clip limit surface **99** may therefore be said to be engageable with the edge of the electronic device **12** to determine a reach of the light inlet **312** on the rear face **18** of the electronic device **12**. The reach of the light inlet **312** is shown at R in FIG. **3** and is the distance of the surface **99** to the center of the light inlet **312**.

It will further be understood by one skilled in the art that, as also can be seen in FIG. **3**, when the clip **32** is positioned such that the projector **22** can perform its selected function (i.e. of projecting the image on the receiving surface **28**), the reach R of the clip **32** is such that the clip limit surface **99** is spaced from the edge of the electronic device **12** for at least one type of electronic device, which permits the same clip **32** to be usable to mount the projector **22** to different types of electronic device **12** that have different distances of the light-emitting element **20***b* to the edge of the electronic device **12**. Worded another way, the clip limit surface **99** is positioned such that, for a first type of smartphone **12** in which the electronic device feature **20***b* is positioned at a first distance from the edge **97**, the clip is mountable to the first type of smartphone **12** with the external device feature **312** aligned with the electronic device feature **20***b* on the rear face **18** such that the clip limit surface **99** is spaced from the edge **97** (which is true, for example, in FIG. **3**). For a second type of smartphone **12** in which the electronic device feature **20***b* is positioned at a second distance from the edge **97** that is different than the first distance (inferable from FIGS. **6**A, **6**B and **6**C, the clip **32** is mountable to the second type of smartphone **12** with the external device feature **312** aligned with the electronic device feature **20***b* on the rear face **18** of the second type of smartphone **12**.

The arm marker **36** (shown more clearly in FIGS. **3** and **8**) on the first arm **34** may have a similar shape to the screen marker **44** shown in FIG. **6**A (e.g. a circle with a cross hair therein) such that alignment of the arm marker **36** with the position and orientation of the screen marker **44** means superposition of the arm marker **36** on the screen marker **44**. For this purpose, the arm marker **36** may be provided in a transparent portion **53** of the first clip arm **34**. In other embodiments, however, the screen marker **44** may be some other shape and the arm marker **36** need not be provided in a transparent portion of the first clip arm **36** in order to be aligned with the position and orientation of the screen marker **44**. For example, the arm marker **36** may include three arrowheads **54** as shown in FIG. **7**, which are positioned at three points along the edge of first clip arm **34**, and the screen marker **44** may include three other arrowheads **56** that would just abut the three arrowheads **54** on the arm marker **36** when the arm marker **36** is aligned with the position and orientation of the screen marker **44**. In such an embodiment, the first clip arm **34** need not include a transparent portion.

Reference is made to FIGS. **9**, **10**A, **10**B and **10**C. The mounting of the external device **22** to the second arm **38** is now described in more detail. It is optional that a releasable connection shown generally at **58** (FIGS. **10**A and **10**B) be provided between the clip **32** and the external device **22**. This permits the user to change out the clip **32** for a different one that has preferred features. For example, a slide disk **30**

may come in a package with a new clip that has a certain ornamentation theme on it that matches the story illustrates in the slides **24** on the disk **30**. The user may switch out the standard clip **32** that came with their device **22** for the new clip to provide increased enjoyment during viewing of the slides **24** on the disk **30**. In other embodiments, another clip may be provided for other reasons. For example, while the clip **32** may work generally with a range of different electronic devices, the user may purchase a certain clip that is specifically tailored to fit the specific smartphone **12** that the user owns with reduced obstruction of the display screen **16**.

The releasable connection **58** may include a toothed locking arm **60** integrated into one of the second clip arm **38** and the external device **22** and a shoulder **62** on the other of the second clip arm **38** and the external device **22**. The toothed locking arm **60** is resiliently flexible and includes a locking tooth **64** thereon. The toothed locking arm **60** flexes (FIG. **10**A) when slid past the shoulder **62** in a first direction (e.g. downwards in the view shown in FIG. **10**A) and is urged by its resiliency to a locking position (FIG. **10**B) wherein the locking tooth **64** overlaps the shoulder **62** to lock the external device **22** to the second clip arm **38**.

In the embodiment shown, the toothed locking arm **60** is provided on the second clip arm **38** and the shoulder **62** is provided on the external device **22**. More specifically, the shoulder **62** is provided on a first housing portion **66***a* of the external device **22**. The housing of the external device **22** may further include a second housing portion **66***b* and a third housing portion **66***c*. A slot **67** (FIG. **9**) may be provided in the housing (e.g. between housing portions **66***a* and **66***b*), so that the shoulder **62** and the toothed locking arm **60** are hidden when the external device **22** is mounted to the second clip arm **38**.

The locking tooth **64** shown is provided with a chamfered leading edge **65** in order to facilitate the passing of the locking tooth **64** past the projection on the housing portion **66***a* that has the shoulder **62** on it. Additionally or alternatively, the projection that has the shoulder **62** on it may be provided with a chamfered edge.

When the toothed locking arm **60** is in the locking position shown in FIG. **10**B, a flange **68** on the toothed locking arm **60** may engage an engagement surface **69** of the housing of the external device **22** to cooperate with the engagement of the locking tooth **64** and the shoulder **62** to help retain the external device **22** on the second clip arm **38**.

The toothed locking arm **60** is movable away from the locking position (FIG. **10**C) so as to be slid past the shoulder in a second direction (e.g. upwards in the view shown in FIG. **10**A) for separation of the second clip arm **38** from the external device **22**. In the embodiment shown, a release aperture **70** is provided in the housing portion **66***a* that permits a user to insert a paperclip end or the like to push the toothed locking arm **60** away from the locking position.

In some embodiments it is possible that the application **42** is executable by the electronic device **12** so as to instruct the electronic device **12** to display a screen marker on the display screen **16** in a selected position such that positioning of the first clip arm **34** on the display screen **16** with the arm marker **36** aligned with the position of the screen marker positions the external device **22** in alignment with the at least one electronic device feature. In other words, in some embodiments, it is not necessary for the screen marker **44** to have a distinguishable orientation in order to ensure that the external device **22** is suitably aligned with the at least one electronic device feature **20**. In such embodiments, the at least one electronic device feature is a single feature and the screen marker and the single feature **20** are aligned with one another. Additionally, the arm marker **36** on the first clip arm **34** and the element of the external device **22** that would be aligned with the electronic device feature **20** would be aligned. As a result, when the device-and-clip assembly **21** is placed with the arm marker **36** aligned with the screen marker, the element on the external device **22** is automatically already in alignment with the electronic device feature **20**. Thus it may be said that an application for the electronic device **12** may be provided that is executable by the electronic device so as to instruct the electronic device **12** to display a screen marker **44** on the display screen in a selected position such that positioning of the first clip arm **34** on the display screen **16** with the arm marker **36** aligned with the position of the screen marker **44** positions the external device **22** in alignment with the at least one electronic device feature (e.g. the light-emitting element **20***b*) to perform a selected function (which in this case is to transmit light through the projector **22** to project the image on the slide transparency **24** on the receiving surface **28**).

An example of the projector is shown at **300** in front and rear exploded perspective views in FIGS. **11**A and **11**B. The projector **300** has a light passage **310** (which may also be referred to as an aperture **310**) therethrough. The projector **300** has an inside face **311** that defines a light inlet **312** to the light passage **310**, and an outside face **313** defining a light outlet **314** from the light passage **310**.

The projector **300** includes a slide frame receiving slot **330** positioned to hold a slide transparency **402** in the light passage **310** for transmission of light therethrough. The slide transparency **402** may be provided on a slide frame **400** that holds one or more slide transparencies **402** (i.e. the side frame **400** holds at least one slide transparency **402**). The slide frame **400** may be similar to the slide disk **30** in FIG. **2**, however the slide frame **400** includes rectangular slide transparencies **402**, whereas the slide disk **30** includes circular transparent slides **24**. The term slide transparency and transparent slide may be used interchangeably. The term 'slide frame' is intended to be broader than 'slide disk' and is intended to encompass elements that hold one or more slides and which have shapes that are other than circular.

The slide frame receiving slot **330** contains a slide frame alignment mechanism **332** for engaging with the center of slide frame **400**. The center of slide frame **400** can have a hole, depression, protrusion, axle or any other suitable structure that mates with the slide frame alignment mechanism **332** to position the slide frame **400** in position and allow for rotation thereof. FIG. **11**A illustrates a flexible protrusion **332** that can engage a hole or depression at the center of the slide frame **400**.

FIGS. **11**A and **11**B illustrate an embodiment having a focus adjustment mechanism that allows movement of the magnifying lens **340**. The focus adjustment mechanism includes a lens slide **362** that can move forwards and backwards (i.e. axially) within the aperture **310**. The focus adjustment mechanism includes a lens attachment **364** that clips onto the lens slide **362** to hold the magnifying lens **340** in a press-fit between the lens attachment **364** and the lens slide **362**. The focus adjustment mechanism may be any suitable structure for permitting a user to move the magnifying lens **340** so as to adjust its distance from the slide **402**.

The projector **300** is, as noted above, an example of an external device **22** that may be used with the clip **32** (FIGS. **1**-**10**C). When the clip **32** is in the closed position, the projector is holdable by the clip **32** such that the light inlet **312** faces the light-emitting element **20***b* so as to receive light therefrom into the light passage **310**, so as to transmit

the light through the slide transparency **402**, and project an image on the slide transparency **402** out through the light outlet **314** onto a suitable receiving surface.

Another variant of the projector is shown at **700** in FIGS. **12**A and **12**B. FIG. **12** shows a projector **700** that is separate from and attached to an example of the mobile device **12**A. FIG. **12**B is a cross-sectional view of the image projection device **700** along line A-A in FIG. **12**A. The image projection device **700** has a body **702** that has an aperture **710** therethrough, which may also be referred to as a light passage, which is alignable with camera flash **20***b*. A slide transparency **802** is alignable with aperture **210** and is illuminated by camera flash **20***b*. Magnifying lens **740** enlarges illuminated slide transparency **402** onto a projection surface, such as a wall, ceiling, or projection screen.

The projector **700** has a body **702** and an attachment mechanism **720**, which could optionally be a mechanical clamp such as the clip **32**. The body **702** has an inside face **726** that defines a light inlet **727** to a light passage **710** (also referred to as an aperture **710**), and an outside face **728** that defines a light outlet **729** from the light passage **210**. The body **702** further provides a slide frame receiving slot **730** (which may, more broadly, be referred to simply as a slot **730**) that is shaped to receive a slide frame **800** that contains any number of slide transparencies **802** (i.e. at least one slide transparency **802**). The slot **730** is positioned to hold a slide transparency **802** in the light passage **710** for transmission of light therethrough.

The slide frame **800** can be round, rectangular or any other shape, and the slide frame receiving slot **730** will have a corresponding shape to accommodate the slide frame **4800**. The slide frame receiving slot **730** may be transverse to the aperture **710** in order to position slide frame transparencies within the aperture **710**. The camera flash **20***b*, under control of the mobile device **12**, illuminates the slide transparency **802** within the aperture **710**. The slide frame receiving slot **730** can be formed within the body **702**, as shown in FIG. **12**B, or in a channel on the rear-facing surface of body **702** (i.e. the outside face **728**). The position of the slide frame receiving slot **730** with respect to the body **702**, the camera flash **20***b*, and the magnifying lens **740** can be selected to optimize image projection quality.

The magnifying lens **740** is aligned with the aperture **710** and positioned at the front of the body **702** of the image projection device **700**. The magnifying lens **740** is positioned between the illuminated a slide transparency and the projection surface. The magnifying lens **740** enlarges the slide transparency **802** that is illuminated by camera flash **20***b* for projection onto a projection surface, such a wall or ceiling, for example. Although a simple biconvex lens is shown for illustration purposes, a person skilled in the art would provide the appropriate lens design to provide magnification and projection of a slide transparency. This can include compound lens designs involving more than one lens.

Some embodiments of the image projection device **700** can further include a focus adjustment mechanism **760** that houses the magnifying lens **740**. The focus adjustment mechanism **760** can allow translation of the magnifying lens **740** axially with respect to the aperture **710** to change the distance between an illuminated slide transparency **802** and magnifying lens **740** in order to alter the magnification or focus of the projected image. The focus adjustment mechanism **760** can include a telescoping arrangement or a screw-type arrangement that allows for movement of the magnifying lens **740**. In a compound lens design that utilizes two or more lenses, only one of the lens may be moveable by the focus adjustment mechanism **760**.

Preferred embodiments of the image projection device **700** can also include a flash conditioner **750** that is aligned with, or positioned within, the aperture **710** between camera flash **20***b* and a slide transparency **702**. The flash conditioner **750** is positioned on an opposite side of the slide frame receiving slot **730** from magnifying lens **740** such that the optical path from the camera flash **20***b* passes through the flash conditioner **750**, followed by a slide transparency, and finally magnified by magnifying lens **740**. The flash conditioner **750** can assist with providing proper and full illumination of the slide transparency **802**. The flash conditioner **750** can include, for example, a light diffusing material or an optical condenser, such as a collimation lens (e.g. a plano-convex lens), or a combination thereof. For example, a plano-convex lens can be used so that incoming LED light beams from camera flash **20***b* are formed into parallel light beams as they hit the slide transparency so the projected image can have improved clarity. In embodiments used to project photographic-quality slides, a flash conditioner may be used to obtain reasonable clarity of the projected image.

The aperture **710** can have a variety of shapes. The aperture **710** can be round to accommodate a round magnifying lens **740**, for example. Aperture **710** can also be shaped similar to the shape of the slide transparencies on the slide frame, which can be round, rectangular, or any other shape, so that slide transparency **802** completely fills aperture **710**. Aperture **710** can also be conically shaped, or similarly have an increasing size, from the rear surface of body **702** adjacent to camera flash **20***b* to the front surface of body **702**.

When the clip **32** is in the closed position, the projector **700** is holdable by the clip **32** such that the light inlet **727** faces the light-emitting element **20***b* so as to receive light therefrom into the light passage **710**, so as to transmit said light through the slide transparency **802**, and project an image on the slide transparency **802** out through the light outlet **729** onto a suitable receiving surface such as surface **28** in FIG. **4**.

Persons skilled in the art will appreciate that there are yet more alternative implementations and modifications possible, and that the above examples are only illustrations of one or more implementations. The scope, therefore, is only to be limited by the claims appended hereto.

What is claimed is:

1. A device-and-clip system for an electronic device having a front face with a display screen thereon, a rear face opposite to the front face, and an edge between the front and rear faces, the device-and-clip system comprising:

an external device that is separate from the electronic device and which has an external device feature, wherein the external device is cooperable with the electronic device when the external device feature is aligned with an electronic device feature on the rear face to perform a selected function;

a clip including

a first clip arm having an arm marker thereon and which is engageable with the front face;

a second clip arm that is engageable with the rear face, wherein the first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device, wherein the external device is mounted to the clip; and

wherein the clip has a clip limit surface that is engageable with the edge of the electronic device to determine a reach of the external device feature on the rear face of the electronic device,

wherein the clip limit surface is positioned such that, for a first type of electronic device in which the electronic device feature is positioned at a first distance from the edge, the clip is mountable to the first type of electronic device with the external device feature aligned with the electronic device feature on the rear face such that the clip limit surface is spaced from the edge,

and for a second type of electronic device in which the electronic device feature is positioned at a second distance from the edge that is different than the first distance, the clip is mountable to the second type of electronic device with the external device feature aligned with the electronic device feature on the rear face of the second type of electronic device.

2. A device-and-clip system as claimed in claim **1**, further comprising an application that is executable by the electronic device so as to instruct the electronic device to display a screen marker on the display screen in a selected position such that positioning of the first clip arm on the display screen with the arm marker aligned with the position of the screen marker positions the external device in alignment with the at least one electronic device feature.

3. A device-and-clip system as claimed in claim **1**, wherein the at least one electronic device feature includes a light-emitting element.

4. A device-and-clip system as claimed in claim **3**, wherein the external device is a projector that is positionable to receive light from the light-emitting element, to pass the light through a transparent slide containing an image, and to project the image onto a suitable receiving surface.

5. A device-and-clip system as claimed in claim **1**, wherein the first clip arm includes a transparent portion and the arm marker is positioned in the transparent portion.

6. The image projection device of claim **1**, wherein the projector further includes a flash conditioner aligned with the aperture and opposite the magnifying lens with respect to the slot.

7. The image projection device of claim **1** further comprising a focus adjustment mechanism containing the magnifying lens, the focus adjustment mechanism for translating the magnifying lens axially with respect to the aperture.

8. The image projection device of claim **7**, wherein the focus adjustment mechanism is any one of a telescoping mechanism and a screw-type mechanism.

9. A device-and-clip system for an electronic device having a front face with a display screen thereon, and a rear face opposite to the front face, the device-and-clip system comprising:

an external device that is separate from the electronic device but which cooperates with at least one electronic device feature on the rear face to perform a selected function;

a clip including

a first clip arm having an arm marker thereon and which is engageable with the front face;

a second clip arm that is engageable with the rear face, wherein the first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device, wherein the external device is mounted to the clip; and

an application that is executable by the electronic device so as to instruct the electronic device to display a screen marker on the display screen in a selected position such that positioning of the first clip arm on the display screen with the arm marker aligned with the position of the screen marker positions the external device in alignment with the at least one electronic device feature.

10. A device-and-clip system as claimed in claim **1**, wherein the at least one electronic device feature includes a light-emitting element.

11. A device-and-clip system for an electronic device having a front face with a display screen thereon, and a rear face opposite to the front face, the device-and-clip system comprising:

a projector that is separate from the electronic device, wherein the projector has an aperture therethrough, an inside face defining a light inlet to the aperture, and an outside face defining a light outlet from the aperture, wherein the projector further includes a slot positioned to hold a slide transparency in the aperture for transmission of light therethrough, wherein the projector further includes a magnifying lens aligned with the aperture and positioned to enlarge an image on the slide transparency for projection through the light outlet; and

a clip including

a first clip arm that is engageable with the front face; and

a second clip arm that is engageable with the rear face, wherein the first and second clip arms are connected to one another and are movable between an open position to permit removal of the clip from the electronic device and a closed position in which the first and second clip arms clamp the electronic device,

wherein, in the closed position, the projector is holdable by the clip such that the light inlet faces the light-emitting element so as to receive light therefrom into the light passage, so as to transmit said light through the slide transparency, and project an image on the slide transparency out through the light outlet onto a suitable receiving surface.

12. The image projection device of claim **1**, wherein the projector further includes a flash conditioner aligned with the aperture and opposite the magnifying lens with respect to the slot.

13. The image projection device of claim **1** further comprising a focus adjustment mechanism containing the magnifying lens, the focus adjustment mechanism for translating the magnifying lens axially with respect to the aperture.

14. The image projection device of claim **13**, wherein the focus adjustment mechanism is any one of a telescoping mechanism and a screw-type mechanism.

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